DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 95TH AIR BASE WING (AFMC)
EDWARDS AIR FORCE BASE, CALIFORNIA

30 May 2008

MEMORANDUM FOR: SEE DISTRIBUTION

FROM: 95 ABW/EMR
5 E. Popson Avenue, Bldg 2650A
Edwards AFB CA 93524-8060

SUBJECT: Record of Decision, AFRL Soil and Debris Sites, OUs 4 and 9 – Final

1. Transmitted herein is one copy (or two copies) of the document listed above.

2. Please recycle any copies of the now-obsolete pre-signature submittal sent on 25 April 2008.

3. Replacement pages (i.e., the signed signature pages and errata, if any) will follow as needed.

4. If you have any questions or comments, please call me at (661) 277-1474 or Patrice Hallman at 277-1419.

AI DUONG
Chief, Environmental Restoration Division

Attachment: Record of Decision, AFRL Soil and Debris Sites, OUs 4 and 9 – Final

DISTRIBUTION:
- Mr. Joe Healy - U.S. EPA, Region 9 (1 copy)
- Ms. Thelma Estrada - U.S. EPA, Region 9 (1 copy)
- Ms. Karla Brasaemle - TechLaw, Inc. (1 copy)
- Mr. John Harris - Cal/EPA, DTSC (4 copies)
- Mr. Jehiel Cass - Water Board (2 copies)
- Mr. David Coupe - Water Board (1 copy).

OU 11 (CERCLIS OU)
ROD front pages

ENVIRONMENTAL RESTORATION PROGRAM
RECORD OF DECISION
AIR FORCE RESEARCH LABORATORY
SOIL AND DEBRIS SITES
OPERABLE UNITS 4 AND 9

EDWARDS AIR FORCE BASE
CALIFORNIA

MAY 2008

FINAL

Prepared for

U.S. AIR FORCE 95th AIR BASE WING
ENVIRONMENTAL RESTORATION DIVISION (95 ABW/EMR)
EDWARDS AFB, CA 93524-8060

and the

ERP PROGRAM OFFICE
AIR FORCE CENTER FOR ENGINEERING AND THE ENVIRONMENT/
ENVIRONMENTAL PROGRAMS EXECUTION - WEST (AFCEE/EXEW)
BROOKS CITY-BASE, TX 78235-5112

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°F	degrees Fahrenheit
$\mu g/100\ cm^2$	micrograms per 100 square centimeters
$\mu g/L$	micrograms per liter
95 ABW/EMR	95th Air Base Wing/Environmental Restoration Division
AFB	Air Force Base
AFCEE/EXEW	Air Force Center for Engineering and the Environment/Environmental Programs Execution - West
AFRL	Air Force Research Laboratory
AOC	area of concern
ARAR	Applicable or Relevant and Appropriate Requirement
ASTM	American Society for Testing and Materials
AVEK	Antelope Valley-East Kern Water Agency
BB	butylbenzene
bgs	below ground surface
Blvd.	Boulevard
CAI	closed, abandoned, or inactive
Cal/EPA	California Environmental Protection Agency
CAMU	Corrective Action Management Unit
CCR	California Code of Regulations
CE	Civil Engineering
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIWMB	California Integrated Waste Management Board
Co.	County
CO_2	carbon dioxide
COC	chemical of concern (CERCLA definition)
CoC	constituent of concern (CCR Title 27 definition)
COPEC	chemical of potential ecological concern
CZ	containment zone
DCE	dichloroethene
DCFM	dichlorodifluoromethane
DNAPL	dense non-aqueous phase liquid
DTSC	Department of Toxic Substances Control
DFRC	Dryden Flight Research Center
DMP	detection monitoring program
DWR	Department of Water Resources
EAFB	Edwards Air Force Base
EAFB GP	Edwards Air Force Base General Plan
EE/CA	engineering evaluation/cost analysis
EIAP	Environmental Impact Assessment Process
EOD	explosive ordnance disposal
ERA	ecological risk assessment
ERP	Environmental Restoration Program

FCPMP	Final Closure and Post-Closure Maintenance Plan
FFA	Federal Facility Agreement
FS	feasibility study
ft	feet
FTA	fire training area
g	gram
GCL	geosynthetic clay liner
GIS	geographic information system
gpm	gallons per minute
HB&A	Higginbotham/Briggs & Associates
HDPE	high-density polyethylene
HEF	high energy fuel
HHRA	human health risk assessment
HI	hazard index
HpCDD	heptachlorodibenzo-p-dioxin
HpCDF	heptachlorodibenzofuran
HxCDD	hexachlorodibenzo-p-dioxin
ICBM	intercontinental ballistic missile
Ind.	industrial
IPB	isopropylbenzene
IRA	interim remedial action
J&E	Johnson and Ettinger
KCEHSD	Kern County Environmental Health Services Department
kg	kilogram
LTM	long-term monitoring
LUC	land use control
LUFT	Leaking Underground Fuel Tank
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MEC	munitions and explosives of concern
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MMRP	Military Munitions Response Program
MSWLF	municipal solid waste landfill
MTBE	methyl-tert-butyl ether
NA	not applicable
NASA	National Aeronautics and Space Administration
ND	non detect
NDMA	N-nitrosodimethylamine
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NE	not established or not evaluated
NEPA	National Environmental Policy Act
NFA	no further action
NFEI	no further ecological investigation
ng/g	nanograms per gram
NL	notification level

NPC	no public comment
NPL	National Priorities List
NRHP	National Register of Historical Places
OCDD	octachlorodibenzo-p-dioxin
OCDF	octachlorodibenzofuran
OMB	Office of Management and Budget
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PB	propylbenzene
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PCMMP	Post-Closure Maintenance and Monitoring Plan
PERA	predictive ecological risk assessment
pg/g	picograms per gram
PID	photoionization detector
PIRA	Precision Impact Range Area
PP	proposed plan
PPE	personal protective equipment
PRG	preliminary remediation goal
RA	remedial action
RAB	Restoration Advisory Board
RACER™	Remedial Action Cost Engineering and Requirements
RAO	remedial action objective
RAR	relevant and appropriate
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
Res.	residential
RI	remedial investigation
RL	reporting limit
ROD	record of decision
RPM	Remedial Project Manager
RP-1	Rocket Propellant-1
SARA	Superfund Amendments and Reauthorization Act
SERA	scoping ecological risk assessment
SI	site investigation
SLDU	subsurface land disposal unit
SLUC	State Land Use Covenant
START	Strategic Arms Reduction Treaty
STLC	soluble threshold limit concentration
SVE	soil vapor extraction
SVOC	semivolatile organic compound
SWAT	solid waste assessment test
SWRQCB	State Water Resource Quality Control Board
TBC	to be considered
TCDD	tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofuran

TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TDS	total dissolved solids
TEFA	technical and economic feasibility analysis
TEF	toxic equivalency factor
TEPH	total extractable petroleum hydrocarbons
TEQ	toxic equivalency
TI	technical impracticability
TMB	trimethylbenzene
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
TVPH	total volatile petroleum hydrocarbons
UEH	unknown extractable hydrocarbon
U.S.	United States
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USC	United States Code
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	underground storage tank
UVH	unknown volatile hydrocarbon
VIP	vapor intrusion pathway
VOC	volatile organic compound
WDR	waste discharge requirement
WQO	water quality objective

Section 1.0 of ROD
plus signature

1.0 PART 1: DECLARATION

1.1 SITE NAME AND LOCATION

The Air Force Research Laboratory (AFRL); Edwards Air Force Base (AFB); Kern and San Bernardino Counties; California; United States Environmental Protection Agency (USEPA) Identification Number CA1570024504.

1.2 *STATEMENT OF BASIS AND PURPOSE*

This decision document presents the selected remedies for the soil and debris sites at Operable Units (OUs) 4 and 9 at Edwards AFB, California, which were chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by Superfund Amendments and Reauthorization Act (SARA) of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document is based on the Administrative Record File for OUs 4 and 9. Except for Sites 6 and 113, final remedies for groundwater at these sites are (or will be) presented in other Records of Decision (RODs).

The United States Air Force (Air Force) and the USEPA are selecting the remedies contained in this ROD in concurrence with the California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC) and Regional Water Quality Control Board, Lahontan Region (Water Board).

1.3 ASSESSMENT OF OPERABLE UNITS 4 AND 9

This ROD addresses the soil and debris media at 16 sites and two areas of concern (AOCs) located within OUs 4 and 9, and also the groundwater medium at Sites 6 and 113. These sites and AOCs are hereafter referred to as the "soil and debris sites."

1.3.1 OU 4 FURTHER ACTION SITES

The OU 4 Soil and Debris sites that require further action to protect public health or welfare or the environment are as follows:

- Site 13: AFRL Closed Landfill;
- Site 36: Test Area 1-21 Former Wastewater Evaporation Tank;
- Site 167: Test Area 1-46 Beryllium Firing Range;
- Site 312: Test Area 1-14 Polychlorinated Biphenyl (PCB) Spill Area; and
- Site 318: Test Area 1-120 Catch Basin and Evaporation Pond.

The selected response actions presented in this ROD for these sites are necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.3.2 OU 9 FURTHER ACTION SITES

The OU 9 Soil and Debris sites that require further action to protect public health or welfare or the environment are as follows:

- Sites 6 and 113: Abandoned Mine Shafts 1 and 2; and
- Site 115: Test Area 1-100 Missile Silos 1 and 2.

The selected response actions presented in this ROD for these sites are necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.3.3 OUs 4 AND 9 NO FURTHER ACTION SITES

The Air Force, as the lead agency, has determined that no further action (NFA) is necessary to protect public health or welfare or the environment at the following sites and AOCs:

- Site 7: Test Area 1-46 Beryllium-Contaminated Earth Piles;
- Site 26: Former Fire Training Area;

- Site 150: Building 8451 Former Waste Evaporation Ponds;
- Sites 153 and 396: Dry Wells associated with Buildings 8419, 8421, 8423, 8425, and 8431;
- Site 166: Building 8240 Former Waste Discharge Area and Removed Waste Oil Underground Storage Tank (UST);
- AOCs 170 and 171: Building 8595 Indoor Vapor Degreaser Pit and Indoor Sump;
- Site 172: Building 8595 Outdoor Waste Sump; and
- Site 329: Test Area 1-46 Former Wash Rack and Oxidation Pond.

Interim remedial actions (IRAs) have reduced formerly high contaminant concentrations at Sites or AOCs 7, 26, 153, 166, 170, 171, 172, and 396 to levels acceptable for unrestricted use. Furthermore, only low-level contamination was originally found at Sites 150 and 329, leaving no need for cleanup actions.

1.3.4 BEDROCK AND GROUNDWATER CONTAMINANT ISSUES

For purposes of this ROD, a distinction is made between contaminants in the soil and/or debris, and contaminants in the underlying bedrock and/or groundwater (see Section 2.4). With the exceptions of Sites 6 and 113, this ROD addresses remedies for the soil (i.e., the unconsolidated alluvium) and debris only, including their associated vapor intrusion pathways (VIPs).

The groundwater below many of the soil and debris sites contains chemicals of concern (COCs) at levels that could be harmful to human health. In some cases, the groundwater contaminants are also assumed to be present in the overlying unsaturated granitic bedrock. These groundwater and bedrock contaminants are generally part of larger areas of groundwater contamination (Plate 1) addressed, or soon to be addressed, separately in other CERCLA RODs as discussed below. Because Sites 6 and 113 do not overlie any of these larger areas of groundwater contamination, a remedy for groundwater contamination associated with these sites is also presented in this ROD.

South AFRL Area. Past disposal practices at Sites/AOCs 13, 26, 150, 153, 166, 170, 171, 172, and 396 (and at other nearby AFRL sites not discussed in this ROD) contributed, or may have contributed, to groundwater contamination by chlorinated solvents, petroleum hydrocarbons, N-nitrosodimethylamine (NDMA), and/or perchlorate. The contaminants from these multiple sources form two widespread

and commingled impacted areas known as the Sites 37 and 133 Groundwater Plumes. The Sites 37 and 133 Groundwater Plumes, as well as the VIP associated with the groundwater contamination, are addressed through land use controls (LUCs) as described in the ROD for the South AFRL area (Earth Tech 2007a), signed in September 2007.

AFRL Arroyos Area. Activities at Site 36 contributed perchlorate contamination to the extensive Site 162 Groundwater Plume (which also includes chlorinated solvents and NDMA from other nearby AFRL sites not discussed in this ROD). Groundwater contamination below Site 36, and possible risk via the VIP from groundwater, will be addressed as part of the forthcoming ROD for the AFRL Arroyos area.

Northeast AFRL and Mars Boulevard Areas. Activities at Sites 115 and 318 (and at other nearby AFRL sites not discussed in this ROD) resulted in groundwater contamination by chlorinated solvents, petroleum fuels, NDMA, and/or perchlorate. The groundwater plumes below these sites are expected to merge with the Sites 177 and 325 Groundwater Plumes located within the Northeast AFRL area. Sites 7, 167, and 329 are located within the Mars Boulevard area. Groundwater contamination (and any VIP issues) at Sites 115, 318, 7, 167, and 329 will be addressed as part of the forthcoming ROD for the Northeast AFRL and Mars Boulevard areas.

1.4 DESCRIPTION OF THE SELECTED REMEDIES

Operations at OUs 4 and 9 resulted in releases of hazardous substances that are distinct and not commingled with hazardous substances released at other OUs at Edwards AFB. The selected remedies summarized below are intended to be the final actions for the soil and debris sites, and are addressed independently of the other OUs and sites at Edwards AFB. Full descriptions of the selected remedies are included in Sections 2.5 through 2.7. The total cost for implementation of all remedies over a 30-year timeframe is estimated at $5,011,000 in today's dollars; the annual cost to continue these remedies beyond 30 years is estimated at $142,000.

1.4.1 FURTHER ACTION SITES IN OU4

1.4.1.1 Site 13 – Closed AFRL Landfill

The strategy for managing potentially hazardous soil, trash, and debris at the closed landfill involves maintaining environmental control and integrity of the existing landfill cover system through continued compliance with the *Site 13 Post-Closure Maintenance and Monitoring Plan (PCMMP,* Earth Tech 2002), including proposed modifications to certain monitoring requirements. This includes:

- Quarterly inspections and maintenance of the cover, the drainage diversion system, the five gas monitoring wells, and the site security measures (fences and gates); and
- Quarterly field monitoring of the five gas monitoring wells for methane and volatile organic compounds (VOCs) with laboratory confirmation samples collected periodically.

If the proposed modifications to the Site 13 PCMMP are approved, sampling of groundwater monitoring wells in the vicinity of the closed landfill will be performed as part of long-term monitoring (LTM) under the South AFRL ROD. As long as potentially hazardous trash and debris remain in the landfill, LUCs will be enforced and reviews will be conducted every 5 years to assess the protectiveness of the selected remedy.

1.4.1.2 Site 36 – Test Area 1-21 Former Wastewater Evaporation Tank

Perchlorate-contaminated soil that exceeds residential use levels at Site 36 will be excavated and disposed off-site at a properly licensed treatment, storage, and disposal facility (TSDF). However, potentially contaminated bedrock (that cannot be excavated) will be managed through LUCs so that the public health is not impacted. Locked vehicle gates and warning signs will be installed, and reviews will be conducted every 5 years (as long as contamination remains above unrestricted use levels) to assess the protectiveness of the selected remedy.

1.4.1.3 Site 167 – Test Area 1-46 Beryllium Firing Range

The strategy for managing buried beryllium-contaminated soil and debris at Site 167 involves regular inspection and maintenance of the subsurface land disposal unit (SLDU) cover system and site fences (installed in 1996). Additionally, signs will be posted on the fences to warn personnel of the presence of buried beryllium-contaminated material. Additional LUCs will be implemented so that the public

health is not impacted. Reviews will be conducted every 5 years (as long as contamination remains above unrestricted use levels) to assess the protectiveness of the selected remedy. Soil outside the fenced SLDU now qualifies for unrestricted use with NFA.

1.4.1.4 Site 312 – Test Area 1-14 PCB Spill Area

The overall cleanup strategy for PCBs in soil and concrete at Site 312 involves closure through physical removal of the contaminated media. The selected remedy is designed to return the site to conditions suitable for residential (i.e., unrestricted) use. Closure will be accomplished through excavation of soil exhibiting PCB contamination above the 1.0 milligram per kilogram (mg/kg) Toxic Substances Control Act (TSCA) limit for hypothetical residential use (i.e., most of the soil in the substation); and by cutting the concrete pad and removing the portions exhibiting surface contamination in excess of the 10 micrograms per 100 square centimeters ($\mu g/100\ cm^2$) TSCA limit for residential use. The removed soil and concrete will be disposed off base at a properly licensed TSDF.

1.4.1.5 Site 318 – Test Area 1-120 Catch Basin and Evaporation Pond

Contamination in soil from polycyclic aromatic hydrocarbons (PAHs) at Site 318 will be managed through the use of LUCs implemented so that soil contaminants do not impact the public health. Locked vehicle gates and warning signs will be installed, and reviews will be conducted every 5 years (as long as contamination remains above unrestricted use levels) to assess the protectiveness of the selected remedy.

1.4.2 FURTHER ACTION SITES IN OU9

1.4.2.1 Sites 6 and 113 – Abandoned Mine Shafts 1 and 2

Potentially-explosive debris buried in the capped Sites 6 and 113 mine shafts will be managed through the use of LUCs. This will be accomplished by limiting the land use (within the LUC boundaries) to on-site waste management; and by preventing site access by the general public, industrial workers, and unauthorized construction workers. The LUCs will also include groundwater monitoring. Degraded on-site fences and warning signs will be replaced, and reviews will be conducted every 5 years (as long as the potential hazards exist) to assess the protectiveness of the selected remedy.

1.4.2.2 Site 115 – Test Area 1-100 Missile Silos 1 and 2

Potentially-explosive debris in the Site 115 missile silos will be managed through the use of LUCs. This will be accomplished by limiting the land use (within the LUC boundaries) to on-site waste management; and by preventing site access by the general public, industrial workers, and unauthorized construction workers. Fences and warning signs will be installed, and reviews will be conducted every 5 years (as long as the potential hazards exist) to assess the protectiveness of the selected remedy.

1.5 STATUTORY DETERMINATIONS

The selected remedies are protective of human health and the environment, comply with Federal and State requirements that are applicable or relevant and appropriate to the remedial actions, and are cost effective. However, the selected remedies do not satisfy the preference for treatment as a principal element that permanently and significantly reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants. The rationale for this departure is provided for each site in Part 2 – Decision Summary.

1.6 AUTHORIZING SIGNATURES AND SUPPORT AGENCY ACCEPTANCE OF THE SELECTED REMEDIES

Nancy P Wharton

Date 9 May 08

NANCY P. WHARTON, Colonel, USAF
Commander, 95th Air Base Wing
Edwards Air Force Base, California

Date 4 August 08

MICHAEL M. MONTGOMERY
U.S. EPA Branch Chief, Federal Facilities and Site Cleanup Branch
U.S. Environmental Protection Agency, Region 9

The State of California, Department of Toxic Substances Control and the California Regional Water Quality Control Board, Lahontan Region had an opportunity to review and comment on this Record of Decision, and our concerns were addressed.

Date _____

ANTHONY J. LANDIS, P.E.
Supervising Hazardous Substances Engineer II
Cal Center Cleanup Program
California Department of Toxic Substances Control

Date _____

HAROLD SINGER
Executive Officer
California Regional Water Quality Control Board, Lahontan Region

VCMA for ICIS

ICIS claim File

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

June 4, 2008

MEMORANDUM

TO: EPA's Edwards AFB Oversight File

FROM: Joe Healy (EPA RPM)

RE: Volume of Contaminated Media Addressed for OU 4&9 AFRL Soil & Debris Sites ROD

On June 4, 2008, I received an email from an Air Force contractor (attached) that provided EPA with corrected estimates of the Volume of Contaminated Media Addressed (VCMA) for the OU 4&9 AFRL Soil & Debris Sites ROD. Because the Air Force interpretation of VCMA varied slightly and considered LUCs that EPA does not include, I created the following table from the Air Force information to highlight the data entries I intend to make into EPA's ICIS database for VCMA. Please note that CERCLIS identifies this Air Force ROD as OU 11, whereas the Air Force OU numbers in their document titles are related to operable unit areas and not to individual RODs.

The above ROD selected actions for eight sites and No Action for ten sites. Of the eight action sites, one did not involve an action considered by EPA to be eligible for the ICIS database VCMA entries (i.e., Site 318 LUCs did not include physical containment of the contaminated media).

Site Name	Media	Volume Addressed	Applicable Remedy
Site 13 Closed Landfill	Soil and Debris	338,800 cu yds	Containment under Landfill cover
Site 36 Former Wastewater Evaporation Tank	Soil	50 cu yds	Removal and off-site disposal
Site 167 Beryllium Firing Range	Soil and Debris	11,900 cu yds and 80 cu yds	Containment under SDLU cover
Site 312 PCB Spill Area	Soil and Concrete	73 cu yds and 5 cu yds	Removal and off-site disposal
Site 6 Abandoned Mine Shaft	Soil and Debris	1300 cu yds	Containment under Asphalt cover
Site 113 Abandoned Mine Shaft	Soil and Debris	1300 cu yds	Containment under Asphalt cover
Site 115 Missile Silos	Soil and Debris	1801 cu yds	Containment under Metal cover

In Summary, the OU 4&9 AFRL Soil and Debris Sites ROD addresses by excavation and off-site disposal, a total of 123 cubic yards of soil and 5 cubic yards of concrete at two sites; and the ROD addresses by containment beneath surface covers, a total of 355,181 cubic yards of mixed soil & debris at five other sites. The combined total VCMA for this ROD, as defined by EPA for entry into the ICIS database, is 355,309 cubic yards.

Attachment 1a:
Text from Air Force Contractor's June 4, 2008 email

Attached is the revised volume estimate. Changed or added text is in red. Please call if you have any questions.

Glenn Wagstaff
Geologist
Earth Tech, Inc.
Phone (562) 951-2219
Fax (562) 951-7917

From: Healy.Joseph@epamail.epa.gov [mailto:Healy.Joseph@epamail.epa.gov]
Sent: Tuesday, June 03, 2008 5:28 PM
To: Wagstaff, Glenn; patrice.hallman@edwards.af.mil
Subject: Fw: ROD information required by EPA HQ

Glenn and I spoke about the attachment indirectly during the course of our discussing my Conceptual Site Model tables and the review of the Soil & Debris ROD. During those discussions, Glenn told me of some changes he discovered that needed to be made, and I described a different need for the Site 13 landfill (only need to know estimate of area times average depth of the capped material). I think either or both Sites 36 and 312 had some errors that Glenn could now fix.

It would help Thelma and I prepare our briefing package of you can re-issue the attachment with the above modifications or corrections. I need them by COB this Friday 6/6 and think they should be very quick for Glenn (he has the new dimensional numbers or the corrected ones already).

Thanks.

Joseph Healy, RPM
US EPA Region 9
75 Hawthorne St., (SFD-8-1)
San Francisco, CA 94105

desk: 415-972-3269
FAX: 415-947-3528
healy.joseph@epa.gov

Attachment 1b:
Text from file attached to
Air Force Contractor's June 4, 2008 email

Volumes of Contaminated Media Addressed at the OUs 4 and 9 Soil and Debris Sites

Site 13

Historical data (Earth Tech 1998) show that an average of 2,000 cubic yards of trash and debris were deposited at the Site 13 Landfill annually between 1977 and 1991. Extrapolating this average back to 1961 (the first year of landfill use) yields approximately 60,000 cubic yards over the 30-year active life of the landfill.

Assuming an area of 21 acres (914760 ft^2) and an average depth to bedrock of 10 ft, the total volume of soil and debris (not bedrock) beneath the Site 13 landfill cover is 338,800 cubic yards.

Site 36

Per Section 2.5.2.6 of the final ROD, the volume of soil to be excavated is estimated at 50 cubic yards. This will remove nearly all the soil in a 12-foot radius around the tank to a depth of 3 feet (assumed bedrock contact).

The volume of potentially impacted bedrock to which construction workers could be exposed is 150 cubic yards. This assumes (1) an impacted circular area measuring 12 feet in diameter, centered on the former tank; (2) 50 cubic yards of the total volume is soil that will be removed; and (3) 12 feet is the maximum likely depth of excavation.

Site 167

Because construction of the Site 167 SLDU was well documented, the volume of impacted soil and debris disposed are accurately known. As described in the IRA discussion in Section 2.5.3.2 of the final ROD, approximately 11,900 cubic yards of soil and 80 cubic yards of debris were buried in the SLDU.

Sites 312

PCBs have impacted both soil and concrete at Site 312; however, the shallow bedrock is not believed to be impacted. As described in Section 2.5.4.6 of the final ROD, essentially all the soil within the substation is going to be excavated. Assuming depth to bedrock is 3 feet, the total excavated volume will be 73 cubic yards. The volume of impacted concrete to be removed is approximately 5 cubic yards.

Site 318

Assuming approximately 20,000 ft^2 of soil in the Site 318 catch basin is impacted with PAHs to a depth of 1.5 feet (bedrock contact), the total volume of PAH-impacted soil is 1,100 cubic yards. It is not assumed that the bedrock is impacted. However if the bedrock is hypothetically included to a depth of 12 feet, the total volume of soil and bedrock is 8,900 cubic yards.

Sites 6 and 113

Historical records do not indicate the quantities of rocket fuel deposited in the mine shafts. The available information indicates that 30 to 40 "flatbed trucks" carrying fuel cylinders were offloaded into the mine shafts (Earth Tech 1993). Assuming that the flatbed trucks were of the 1-ton variety common at the AFRL, and were loaded to capacity, there could have been up to 80,000 pounds of rocket fuel and cylinders deposited in the mineshafts. Assuming that 20% of the total weight was in the metal cylinders, there may have been 64,000 pounds of fuel deposited. Assuming 1% of the fuel failed to burn when detonated, there could be as much as 640 pounds of unburned fuel in the mineshafts (320 pounds per mineshaft). Assuming 5% of the fuel failed to burn when detonated, there could be as much as 3,200 pounds of unburned fuel in the mineshafts (1,600 pounds per mineshaft).

Assuming shaft dimensions of 12 feet x 12 feet x 250 feet, the total volume of soil and debris contained in each backfilled shaft is estimated at 1,300 cubic yards. The top 12 feet of each mineshaft measures 64 feet in volume.

Site 115

The volume of unburned solid rocket fuel in Silo 1 is not known but may range from tens to hundreds of pounds. Assuming silo dimensions of 27 feet in diameter and 86 feet in depth, the total volume of soil and debris contained in backfilled Silo 1 is estimated at 1,800 cubic yards. The top 12 feet of the silo measures 254 cubic yards in volume.

Silo 2 contains no known contaminated media per se. Between 20 and 100 gallons of x-ray developing fluid (acetic acid and aluminum chloride) were deposited on the floor of the silo. If the contaminants penetrated the concrete, up to 1 cubic yard of impacted concrete may be present.